

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

1. (Currently Amended) A method comprising:
providing a wafer comprising a plurality of copper structures partially encased in a hydrophobic interlayer dielectric layer, where top surfaces of the copper structures are exposed and substantially co-planar with a top surface of the hydrophobic interlayer dielectric layer; and
selectively depositing a cobalt capping layer on the top surfaces of the plurality of copper structures with substantially no deposition of the cobalt on the top surface of the interlayer dielectric layer, using an aqueous electro-less bath and applying sonic energy to the aqueous electro-less bath.
2. (Original) The method of claim 1, wherein the applying of sonic energy comprises applying a selected one of mega and ultra sonic energy.
3. (Original) The method of claim 1, wherein the applying of sonic energy comprises applying the sonic energy at a frequency range of 10 to 1200 kilohertz.
4. (Original) The method of claim 1, wherein the applying of sonic energy comprises applying the sonic energy at a power level in a range of 1 to 5 watts/cm².
5. (Original) The method of claim 1, wherein the method further comprises simultaneously rinsing and applying sonic energy to the hydrophobic interlayer dielectric layer after said selective deposition of cobalt.

6. (Currently Amended) A method comprising:

providing a wafer comprising a plurality of copper structures partially encased in a hydrophobic interlayer dielectric layer, where top surfaces of the copper structures are exposed and substantially co-planar with a top surface of the hydrophobic interlayer dielectric layer;

selectively depositing a cobalt capping layer on the top surfaces of the plurality of copper structures; and

simultaneously rinsing and applying sonic energy to the hydrophobic interlayer dielectric layer to decrease the amount of cobalt particles adhered to the hydrophobic interlayer dielectric layer.

7. (Original) The method of claim 6, wherein the applying of sonic energy comprises applying a selected one of mega and ultra sonic energy.

8. (Original) The method of claim 6, wherein the applying of sonic energy comprises applying the sonic energy at a frequency range of 10 to 1200 kilohertz.

9. (Original) The method of claim 6, wherein the applying of sonic energy comprises applying the sonic energy at a power level in a range of 1 to 5 watts/cm².

10. (Withdrawn) An apparatus comprising:

a chamber adapted for cobalt deposition, including a holder to hold a substrate with a hydrophobic interlayer dielectric layer; and

a sonic energy generator coupled to the chamber and adapted to allow sonic energy be applied during deposition of cobalt to cap a number of copper structures disposed on the hydrophobic interlayer dielectric layer.

11. (Withdrawn) The apparatus of claim 10, wherein the apparatus further comprises at least one tank coupled to the chamber and adapted to store and to provide the interlayer dielectric layer with an aqueous electro-less bath; and the sonic energy generator is also adapted to allow sonic energy be applied during the provision of the aqueous electro-less bath.

12. (Withdrawn) The apparatus of claim 10, wherein the sonic energy generator is adapted to apply a selected one of mega and ultra sonic energy.

13. (Withdrawn) The apparatus of claim 10, wherein the sonic energy generator is adapted to apply the sonic energy at a frequency range of 10 to 1200 kilohertz.

14. (Withdrawn) The apparatus of claim 10, wherein the sonic energy generator is adapted to apply the sonic energy at a power level in a range of 1 to 5 watts/cm².

15. (Withdrawn) An apparatus comprising:
a chamber including a holder to hold a substrate with a hydrophobic interlayer dielectric layer;
at least one tank coupled to the chamber and adapted to store and to provide the interlayer dielectric layer with an aqueous electro-less bath; and

a sonic energy generator coupled to the chamber and adapted to allow sonic energy be applied during the provision of the aqueous electro-less bath.

16. (Withdrawn) The apparatus of claim 15, wherein the sonic energy generator is adapted to apply a selected one of mega and ultra sonic energy.

17. (Withdrawn) The apparatus of claim 15, wherein the sonic energy generator is adapted to apply the sonic energy at a frequency range of 10 to 1200 kilohertz.

18. (Withdrawn) The apparatus of claim 15, wherein the sonic energy generator is adapted to apply the sonic energy at a power level in a range of 1 to 5 watts/cm².

19. (Withdrawn) An apparatus comprising:

a hydrophobic interlayer dielectric layer substantially free of adhered cobalt particles;

a copper structure disposed on the interlayer dielectric layer; and
a cobalt capping layer disposed on a top surface of the copper structure.

20. (Withdrawn) The apparatus of claim 10, wherein the hydrophobic interlayer dielectric layer has a low K value where K is a dielectric constant lower than 3.5.

21. (Withdrawn) A system comprising:

a semiconductor package comprising a die, the die having

a hydrophobic interlayer dielectric layer that is substantially free of adhered cobalt, and a plurality of cobalt capped copper structures disposed on the interlayer dielectric layer;

a bus coupled to the semiconductor package; and

a network interface module coupled to the bus.

22. (Withdrawn) The system of claim 21, wherein the semiconductor package comprises a semiconductor device selected from a semiconductor device group consisting of a microprocessor, a memory device, a graphics processor, a digital signal processor, and a crypto processor.

23. (Withdrawn) The system of claim 22, wherein the system is a selected one of a digital versatile disk player, an audio/video media player, and a set-top box.

24. (New) A method comprising:

providing a wafer comprising a plurality of copper structures partially encased in a hydrophobic interlayer dielectric layer, where top surfaces of the copper structures are exposed and substantially co-planar with a top surface of the hydrophobic interlayer dielectric layer;

selectively depositing a cobalt capping layer on the top surfaces of the plurality of copper structures with substantially no deposition of cobalt on the top surface of the hydrophobic interlayer dielectric layer, using an aqueous electro-less bath; and

reducing surface tension of the aqueous electro-less bath during deposition of the cobalt capping layer to increase wettability of the top surfaces of the plurality of the copper structures.

25. (New) The method of claim 24, wherein the reducing of the surface tension of the aqueous electro-less bath comprises applying sonic energy.